Tropical Glacier Area Mapping: Comparison for Landsat-8, PlanetScope and RapidEye

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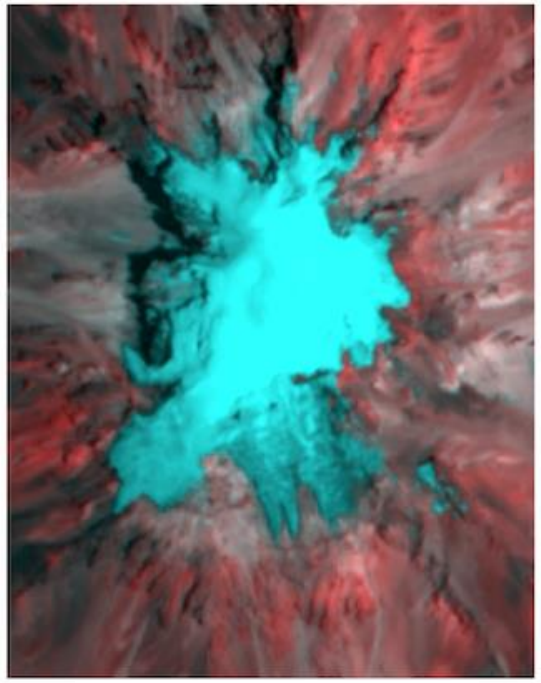
Purpose: Understanding and monitoring of the cryosphere

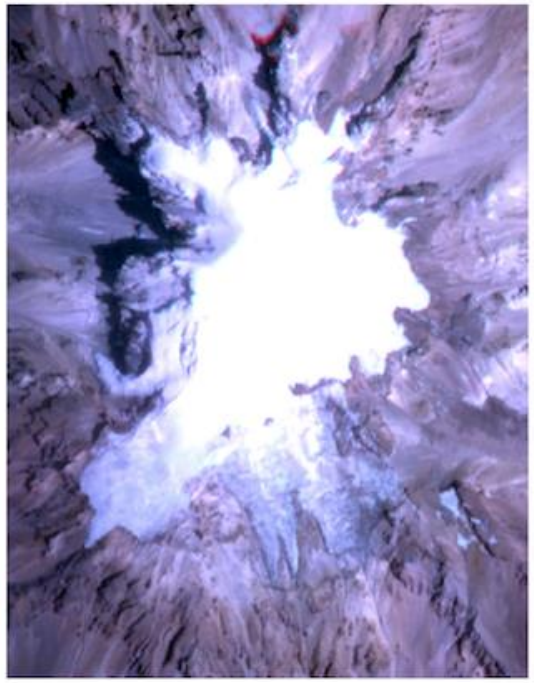
Study Objective: Compare the glacier extent

Imagery: PlanetScope, RapidEye, Landsat-8

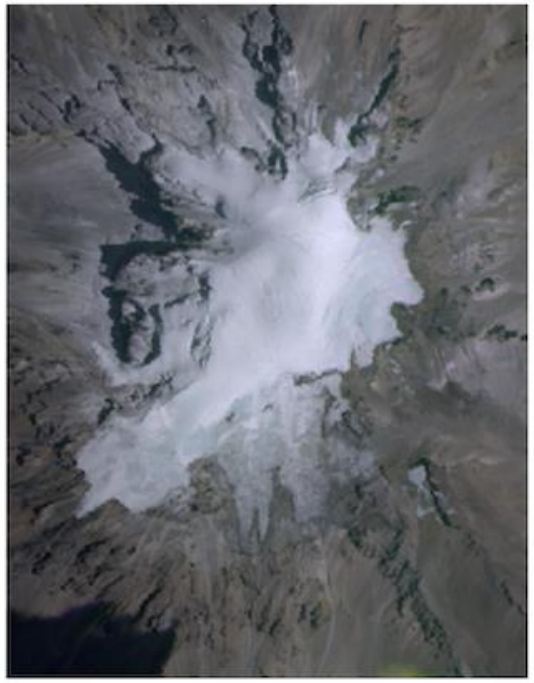
Findings: Despite better spatial and temporal resolution provided by PlanetScope and RapidEye constellation, the lack of SWIR band is a significant limitation. Landsat-8 pansharpened data were superior to PlanetScope and RapidEye for mapping small glaciers because of the SWIR band and its superior ice-non ice spectral contrast.



Landsat-8 acquired 13 Dec. 2018; at 15-meter resolution; pan-sharpened; area: 2.7 km^2



PlanetScope acquired 13 Dec. 2018; at 3-meter resolution; area: 2.1 km^2



RapidEye acquired 11 Dec. 2018; at 5-meter resolution; area: 2.2 km^2

Imagery acquired from Landsat-8 , PlanetScope, and RapidEye over Nevado Sajama stratovolcano in Bolivia. Despite the higher spatial resolution, the lack of a SWIR band on PlanetScope and RapidEye satellites is a source of significant error compared to Landsat-8. The radiometric resolution of PlanetScope is also a contributor to its poorer performance, with indications of pixel saturation. The geolocation errors over steep terrain for PlanetScope were significant - on the order of 6-8 m. The inter-satellite calibration differences made the use of imagery from multiple-satellites for larger glaciers challenging. Similar results were also found over Coropuna stratovolcano in Peru.